ARS Pounces on Sudden Oak Death Pathogen

Inside a biosafety research laboratory at Fort Detrick, Maryland, ARS scientists have closely monitored the reactions of saplings of several common oak species, including white oak, Northern red oak, chestnut oak, cherrybark oak, and coast live oak.

Earlier, the scientists—based at the ARS Foreign Disease-Weed Science Research Unit—had made small cuts on the saplings' stems. Then they'd packed the wounds with plugs of gel-like agar containing *Phytophthora ramorum*—the microbe responsible for sudden oak death. This disease has blighted California oak woodlands and poses a threat to other woody plants as well, including camellias and rhododendrons.

Two months after inoculating the young trees, telltale signs of infection—dark, round lesions—appeared beneath the bark. Of the species tested, white oaks and chestnut oaks suffered the biggest lesions, perhaps indicating greater susceptibility. The observation, while preliminary, could help prioritize which oak species authorities should examine first in forest surveys.

ARS studies delineating the susceptibility of these species and others are helping not only woodland managers but also managers of wholesale and retail nurseries and other specialists who want a clearer picture of the potential impact of sudden oak death.

Of course, these results came from studies of saplings living within the confines of what's referred to as a "Level 3 plant pathogen containment facility," where climate and humidity are carefully controlled. That means the findings may not necessarily reflect the plants' response outdoors. Nevertheless, knowing species' relative susceptibility provides a useful starting point.

P. ramorum can spread by microscopic spheres known as spores, carried by wind, water, or even by soil that can become wedged into the treads of truck, auto, or mountain-bike tires or into the grooved soles of hikers' boots. An article beginning on page 4 of this issue tells more about the pathogen and highlights some of the sudden oak death research under way at a trio of ARS laboratories in California, Oregon, and, as mentioned earlier, Maryland.

There are even more investigations going on at those labs. For instance, Pacific Northwest scientists in Corvallis, Oregon, at the ARS Horticultural Crops Research Unit are exploring the pathogen's survival and its interactions with other microbes living in "compost teas"—the watery, compost-derived extract from farm or home-garden compost heaps that's sprayed on plants.

PEGGY GREB (K11737-1)

Early signs (dying leaves) of sudden oak death on an oak tree.

The Maryland researchers and their ARS colleagues at Salinas, California, are delving deeply into the relatedness, called phylogeny, of *Phytophthora* species. In particular, they've provided new details about the relation of *P. ramorum* to *P. pseudosyringae* and *P. nemorosa,* two relatives commonly found with *P. ramorum* on diseased plants. The California researchers are with the Crop Improvement and Protection Research Unit.

The details that their work has revealed help trace *P. ramorum's* evolution and may suggest how it might next evolve.

Another *Phytophthora* puzzle we hope to solve: Where in the world did *P. ramorum* come from? Our Corvallis scientists are looking for the geographic origin because knowing this could give us a better idea of where the pathogen might go in the future. We would also be able to compare it to samples found in the United States to determine, perhaps, how fast the microbe is evolving.

Thanks to work by scientists elsewhere, we now have a better idea of the structure of *P. ramorum's* genes. In new work scheduled to begin this year at Davis—in northern California—we'll search for the *P. ramorum* genes responsible for sudden oak death. And we'll discover as much as we can about them. We want to find the answers to such questions as: What genes make the microbe so successful in attacking some plant species? Our intent is to use this new information to develop environmentally friendly tactics that undermine these powerful genes.

In all, ARS scientists from about half a dozen different disciplines are dismantling *P. ramorum* to see how it works. The research spans microbiology, plant pathology, molecular biology, bioinformatics (which uses computers to analyze plant-genome data), plant physiology, and epidemiology—among other scientific disciplines.

You've probably heard the old saying, "Tall oaks from little acorns grow." Today, many of our most treasured oak species are unlikely to grow tall or stay that way for long if they're infected with *P. ramorum*. Our research is helping change that grim scenario. These wonderful trees and other delightful woody plants can help clean the air; hold soil in place; provide food and shelter for birds and other creatures; and make our fast-paced, high-tech world more livable.

A. Rick Bennett
ARS National Program Leader
Plant Health
Beltsville, Maryland